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IRON AGE

JUNE 6, 1986

MANUFACTURING MANAGEMENT

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JUNE 6, 1986 VOL 229, NO. 11

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IRON AGE (USPS 269-780) is published 24 times a year by CHILTON COMPANY, Chilton Way, Radnor, PA 19089. Chilton Co. is a division of American Broadcasting Companies, Inc., New York, N.Y. Second Class Postage Paid at Wayne, PA 19087 and additional mailing offices. IRON AGE is sent on a controlled free basis to qualified managers in U.S. metalworking companies. All others: Manufacturing Management edition—$52 one year, $85 Canada/Foreign (24 issues); Metalproducer edition—$30 one year; $56 Canada/Foreign (12 issues). Single copies, $3.00. Cable: Chilton Philadelphia.
Send address changes to IRON AGE, P.O. Box 3017, Wheaton, IL 60189.

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NEW PLAYERS IN THE FACTORY AUTOMATION GAME

Because change is so rampant in the factory automation industry, it is difficult to keep track of the players.

BY ROBERT E. HARVEY

Selling automation solutions to industry is an inconstant occupation. In my desk are a dozen business cards of people in the factory automation business who have changed jobs at least three times in the past four years.

And it is not only the employees who come and go. Companies supplying automation equipment and services play the same game of musical chairs.

Because change is so rampant, it is difficult to keep track of the players.

However, keeping track of the automation vendors and their offerings is critical. In a world of rapidly increasing competition, the firm that knows what is available and who supplies it holds a decided edge.

What follows is a glance at a few areas in the automation marketplace where change is occurring rapidly—areas where a manufacturer might want to cast a sharp eye.

One segment that has seen a deluge of new players in recent years—and in recent months—has been CAD/CAM (computer-aided design/computer-aided manufacturing). CAD/CAM in its broadest sense, that is. Computers integrated into the entire concept-to-design-to-fabrication cycle of a product. When broadly defined, CAD/CAM includes a wide variety of disciplines.

In the early days, CAD/CAM suppliers grew successful by offering turnkey—complete hardware and software systems. Companies like Computervision, Calma, and Applicon, helped popularize a technology that is still the heart of manufacturing modernization efforts today. However, their success not only produced profits but a rash of new competitors.

Because they supply a wide range of CAD/CAM services, the turnkey CAD/CAM vendors have become vulnerable to focused players who direct products to particular segments of the market.

What has happened, says Larry McArthur, president of Aries Technology, Inc., Lowell, Mass., is that vendors of turnkey CAD/CAM systems have tried to be all things to all people but have only been partially successful. For example, some 95 pct of the systems are still used exclusively for drafting.

"What these turnkey firms had going for them," explained Mr. McArthur, "was that each started out with a hellova good drafting system. Then, users began shopping for CAD/CAM by committee. A committee would contain representatives from a firm's concept design engineering group, its structural analysis group, and various tool engineering groups. To accommodate everyone, CAD/CAM vendors made marketing arrangements with various software suppliers.

"Each person wanted something different, but nobody bothered to figure out if the form that the vendors brought these technologies into their CAD/CAM system was acceptable to the users."

Too often, he explained, the customer ended up with a solids modeling package that differed from the drafting package. The drafting package would not work with the analysis package which, in turn, differed from the numerical control package. Different data structures and user interfaces produced major incompatibility problems.

Because of incompatible products, a fuzzy focus and high costs, the turnkey companies became vulnerable to snipers.

New Players Emerge

According to Daratech Assoc., Cambridge, Mass., a firm that researches the CAD/CAM marketplace, in late 1982 a number of

small companies such as Daisy, Mentor, Metheus, Apollo, Orcatech, CADLINC (CIMLINC), CAE Systems, EAS, VLSI Technology, Formtek, Graphic Horizons and others began marketing advanced CAD/CAM systems based on networked workstations using 32-bit micro-processors with multiple co-processors, and large memories.

Lately, personal computers—often the IBM PC AT—has become the computer of choice for innovators. These new players are focusing on CAD/CAM applications inadequately served by older vendors: concept engineering, for example.

"The environment in which today's concept engineers (the initial designers of a product) work has changed little in decades. While many functions surrounding them have been automated, they still work largely in a manual environment," said Richard Miller, vice president, Aries.

Although poorly served until now, several firms such as Aries and Cognition Inc., Billerica, Mass., are moving to address the concept engineer's needs. Cognition is offering the Mechanical Advantage 1000 mechanical computer-aided engineering (MCEA) system this spring, while the Aries' product will be available this fall.

The need to optimize the conceptual design is critical, emphasized Linda Popky, manager, marketing communications, Cognition. The design conception stage is important in determining ultimate product cost, performance, and reliability. However, she noted, engineers do not use CAD systems for this task because they are difficult to learn and frustrating to use.

More importantly, the concept engineer needs a versatile product that is easy to use. Both the Aries and the Cognition system appear to fill that bill. The mechanical engineer would normally initiate a design with a pencil and paper sketch. With the Cognition Mechanical Advantage 1000, using SketchPad, putting design concepts into the system is like sketching with pencil and paper. SketchPad enhances free-hand geometry creation by recognizing geometric constraints specified by the engineer. For example, if the engineer hand-draws two approximately parallel lines, the system has the ability to recognize them as perfectly parallel lines.

Cognition's Advantage allows engineers to optimize product design at the concept stage.

Quick Analysis

After developing the initial geometry, the engineer now wants to analyze design variations. He does not want detailed, time-consuming, analysis tools but quick and easy tests to determine which variation is the most promising. Both Aries and Cognition offer this capability.

A feature of the Cognition Advantage is its ability to build an engineering model that includes geometry, analytical methods and the corresponding engineering principles. A change to sketch geometry automatically causes an update to the related engineering equations and vice versa. The Advantage also offers online engineering handbooks, allowing the designer to rapidly find appropriate information.

Finally, the system provides a product cost guide by bringing together design and process information. The cost guide also can suggest suitable processes for manufacturing the product. The Advantage includes a Cognition Applications Engine Plus, based on a DEC MicroVAX II, networked to augmented IBM PC AT workstations.

The Aries product also includes an IBM PC AT, opening up the world of IBM software to the engineer. Since engineers spend only one-third of their time designing, a workstation with word processing capability, for example, makes sense.

Three benefits of the Aries offering are low cost (under $40,000), the ability to run a variety of software, and the capability do preliminary design analysis; but another is the ability to do solids modeling.

Increasingly, companies are looking to base all their CAD/CAM activities on data-rich solids models.

(Cont. on p. 25.)

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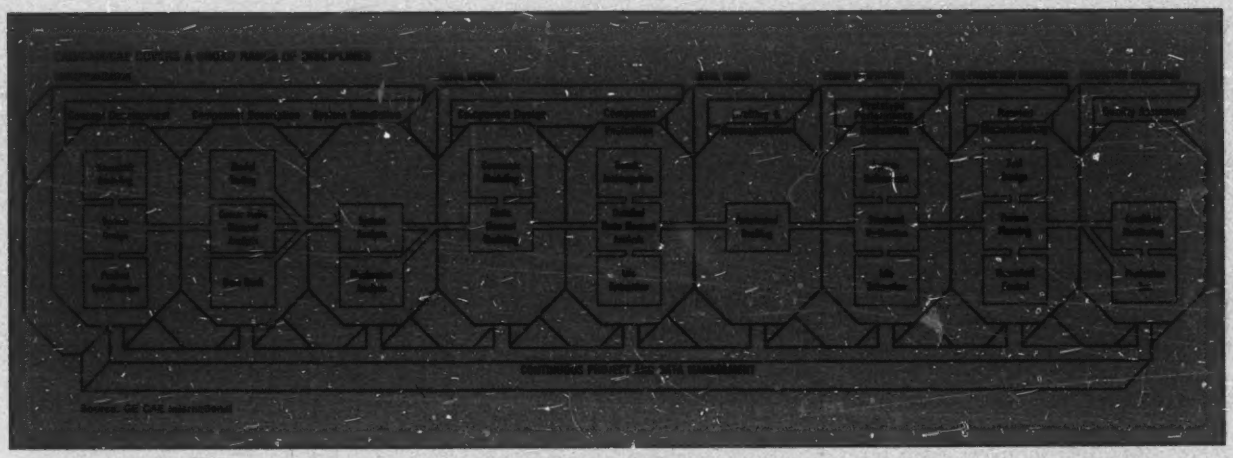

"But up till now solids modeling has been ineffective," said Mr. McArthur. "It is too slow. It only runs on big mainframes. And it is not interactive but a batch process."

By speeding it up, Aries intends to make solids modeling a useful tool. The firm developed specific accelerator hardware that accelerates an IBM PC AT about 250 times faster than normal in the specific computer domains that improve solids modeling performance.

While Aries and Cognition focus on the concept engineer, other companies are targeting other niches along the CAD/CAM spectrum. Docugraphix, Inc., Cupertino, Calif., for instance, concentrates in integrating CAD and documentation. "The basic problem manufacturers faces is making last minute substitutions and design changes prior to shipping a product," explained D.R. Taylor, president and CEO. "These substitutions must be reflected in manufacturing drawings, manufacturing instructions and technical manuals."

Documentation

Since Docugraphix offers a CAD system with fully-integrated text composition capabilities, firms can keep documentation up-to-date. The system can generate new documentation, including manufacturing drawings, manufacturing instructions, purchase part drawings and specifications, and technical publications. It also can handle engineering change notices, is icon- and menu-driven, and uses windows to permit work on multiple documents.

Many new product offerings (like those from Aries and Cognition) incorporate IBM personal computers, but PC usage in CAD/CAM is several years old. In 1982 a company called Autodesk, Inc., Sausalito, Calif., introduced computer-aided design and drafting software that could run on an IBM PC. Before that, CAD/CAM had been done on a mainframe or a minicomputer. But due to the growing power of the microcomputer, and the introduction of the IBM PC AT in particular, CAD/CAM on a PC became a reality. Though a PC can not match the speed and power of larger computers, most companies only use CAD/CAM for two-dimensional detail drafting—a task nicely handled in most cases by a microcomputer.

And while CAD/CAM buyers in the past wanted do-everything systems, they are now buying micro-based tools that can handle just their needs. Faced with paying $100,000 or $200,000 per station for a minicomputer-based system compared to $10,000 or $20,000 for micro-based product, it becomes illuminating to watch how fast the criteria for acceptance change.

Presently there are a number of micro-CAD/CAM vendors, with Autodesk far and away the most successful. But again, new players continue to show up. For example, CADAM, Inc., Burbank, Calif., has just arrived with Micro-CADAM. CADAM is a wholly-owned independent subsidiary within Lockheed Corp.'s Information Systems Group. Unlike other firms supplying CAD/CAM software for the PC, CADAM Inc. is not a new company but the world's largest supplier of CAD/CAM software. IBM markets CADAM for its mainframes and uses the software internally.

Micro-CADAM is a micro-computer-based version of CADAM and offers many of the features of the mainframe version. Designed for the PC AT (or XT) Micro-CADAM can be used independently or in conjunction with an IBM mainframe. Because Micro-CADAM is a subset of the mainframe product, data files can be easily transferred among micros, workstations and mainframe systems. Complex design and engineering projects can be developed on a micro, then uploaded to mainframe CADAM take advantage of larger memory and mainframe modules such as 3-D interactive design, solids modeling, finite element analysis and numerical control.

A number of developments are forcing change on the CAD/CAM industry. One is the growing use of the IBM PC family, which in turn, is prompting customers to expect more price/performance on desktop hardware. Because of the current low cost of CAD/CAM, many people—on the shop floor, especially—are buying systems that never touched a CAD/CAM terminal before.

In another trend, customers are shying away from custom hardware and demanding CAD/CAM software run on standard industry computers: an IBM, Apollo, Sun, or DEC product, for example. Both movements

PRICE & PRODUCTION DATA

(Effective May 12,1986)

Steel production by districts, thousands of tons (000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
Northeast Coast	189	192	197	181
Pittsburgh	243	244	248	199
Youngstown	101	107	109	108
Lake Erie	123	125	172	148
Detroit	151	127	144	153
Chicago	484	496	500	505
Midwest	173	172	165	143
Southern	192	199	200	236
Western	93	84	89	94
U.S. Production	1,749	1,746	1,824	1,767

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports unless otherwise stated. Rail transportation, handling and unloading may be charged to buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural)	gross-ton 58.0*
Pellets (per iron unit natural)	gross-ton 59.4**
Pellets (per iron unit natural)	gross-ton 72.5-86.9***
Mesabi, regular-unscreened	gross-ton $32.53
Mesabi, non-bessemer	gross-ton $30.03-31.53

*58.0¢—Mineral Services, Inc. as of 8/13/85. **59.4¢—Pickands Mather, 8/1/85, delivered hold of vessel, upper Lake ports. ***72.5¢—U.S. Steel as of 8/16/85. 86.9¢—Oglebay Norton 3/25/82; Hanna Mining and Cleveland-Cliffs, 2/26/82.

STEEL PRODUCTION, COMPOSITE PRICES

(Effective May 12,1986)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1986	To Date 1985
Net tons, in thousands	1,749	1,746	32,984	31,930
Capability Utilization Rate	70.7	70.6	71.4	66.6

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 1/1/86)	24.607	24.607	24.607	27.582
Pig Iron** (Net ton= 2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy.*** (Gross ton=2240 lbs.)	$ 71.50	$ 71.50	$ 73.83	$ 70.17
No. 2 bundles	$ 52.17	$ 52.17	$ 53.50	$ 49.17

Scrap Comparison (Gross Ton)

No. 1 steel, Pittsburgh	$ 70.50	$ 70.50	$ 73.50	$ 72.50
No. 1 steel, Philadelphia	71.50	71.50	73.50	69.50
No. 1 steel, Chicago	72.50	72.50	74.50	68.50
No. 1 bundles, Detroit	57.50	57.50	62.50	64.50
Low Phos., Youngstown	70.50	70.50	73.50	57.50
No. 1 mach'y cast., Pgh	73.50	73.50	73.50	71.50
No. 1 mach'y cast., Phila	93.50	93.50	93.50	91.50
No. 1 mach'y cast., Chi	107.50	107.50	109.50	108.50

*Finished Steel Composite: Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.
**Pig Iron Composite: Based on average prices for basic and foundry pig iron at representative producing points within the U.S.
***Steel Scrap Composite: Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

NONFERROUS PRICES

(Effective May 12,1986) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum (LME)	53.48	53.22	5/12/86
Copper (C)	66.50-68.00	67.00-68.00	5/12/86
Lead	19.00-20.00	18.75-20.00	5/ 5/86
Magnesium Ingot	153.00	148.00	12/ 9/85
Nickel (LME)	183.57	182.22	5/12/86
Zinc	35.00	33.00-35.00	5/ 6/86

ALUMINUM: Avg. for last week & previous week. COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, delivered. NICKEL: Avg. for last week & previous week. ZINC: high grade.

Antimony, American Laredo, Texas	$2.00
Beryllium-aluminum 5% Be, per lb. contained Be	$236.00
Beryllium-copper, per lb. cont. Be	$144.00
Beryllium 97% powder 200	$197.00
Cadmium, ton lots	$1.00
Calcium, ton lots, crown	$3.92
Chromium, 99.5% electro	$4.62
Cobalt, 99%, cathode	$11.70
Gold per troy oz.	$345.45
Indium, dollars per troy oz.	$2.65
Iridium, dollars per troy oz.	$423.00
Magnesium sticks, 10,000 lbs.	$2.02
Mercury, per 76-lb., f.o.b. N.Y.	$270.00-285.00
Molybdenum, lb. tech. moly oxides, 20 lb. MO can	$3.25
Palladium, per troy oz.	$109.00
Platinum, per troy oz.	$418.00
Rhodium, per troy oz.	$1,150.00
Silver ingots, per troy oz.	$5.235
Titanium sponge, melt grade	$3.40-3.55
Tungsten powder, hyd red.	$9.50-9.85
Vanadium	$6.00
Zirconium sponge	$12.00-17.00

(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb. EX-SMELTER, based on daily market in Kuala Lumpur in Malaysian dollars per kilo.)

May 5—257.78
May 6—254.48
May 7—254.04
May 8—250.43
May 9—247.47

Scrap Prices

Brass Mill Scrap

(Cents per lb; over 20,000 lbs. add 1¢ per lb)

	Solids	Turnings
Copper	63	56
Yellow brass	53⅛	45¼
Red brass	57¾	48¾
Comm. bronze	59½	49¾
Mang. bronze	41	40
Free cutting rod ends	49	48

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	59
No. 2 copper wire	51
Light copper	42

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	55
No. 2 copper wire	47
Light copper	38
No. 1 composition	46
No. 1 comp. turnings	45
Hvy. yellow brass solids	30
Hvy. yellow brass turnings	26
Radiators	34

Aluminum

New mixed clips	37	— 38
Old sheet	35	— 36
Old cast	35	— 36
Clean dry borings	35	— 37

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum

Segregated clippings	29	— 30
Mixed I.C. clips	26	— 28
Old sheets and cast	24	— 25
Borings and turnings	20	— 21
Duraluminum clippings	24	— 25

Copper and Brass

No. 1 copper wire	48	— 49
No. 2 copper wire	39	— 40
Light copper	33	— 34
Radiators	30	— 31
No. 1 composition	39	— 40
No. 1 composition turnings	35	— 36
Cocks and faucets	28	— 29
Clean heavy yellow brass	27	— 28
Brass Pipe	28	— 29
New soft brass clippings	39	— 40

Lead

Heavy soft lead	5	— 7
Whole batteries	1	— 3
Type metal	15	— 17
Electrotype	13	— 14

Nickel

Nickel solids	110	—120
Nickel rod ends	110	—120
Nickel sheets, clips	110	—120
Nickel turnings	25	— 35

Zinc

New zinc clippings	15	— 16
Old diecast zinc	11	— 12

EFFECTIVE MAY 12,1986

(Effective May 12,1986) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 70.00	to	$ 71.00
No. 2 hvy. melting	60.00	to	61.00
No. 1 dealer bundles	83.00	to	84.00
No. 1 factory bundles (auto)	86.00	to	87.00
No. 2 bundles	46.00	to	47.00
No. 1 busheling	80.00	to	81.00
Machine shop turnings	8.00	to	9.00
Shoveling turnings	43.00	to	44.00
Cast iron borings	42.00	to	43.00
Low phos. punchings plate	99.00	to	100.00
Heavy turnings	60.00	to	61.00
No. 1 RR hvy. melting	81.00	to	82.00
Rails, 2 ft. and under	95.00	to	96.00
Scrap rails, random lgth	80.00	to	81.00
RR specialties	95.00	to	96.00
No. 1 machinery cast	73.00	to	74.00
Cupola cast	66.00	to	67.00
Heavy breakable cast	30.00	to	31.00
Stainless			
18-8 bundles and solids	520.00	to	530.00
18-8 turnings	420.00	to	430.00

Chicago

No. 1 hvy. melting	$ 72.00	to	$ 73.00
No. 2 hvy. melting	68.00	to	69.00
No. 1 dealer bundles	84.00	to	85.00
No. 1 factory bundles (auto)	85.00	to	86.00
No. 2 dealer bundles	58.00	to	59.00
No. 1 busheling	79.00	to	80.00
Shredder scrap	79.00	to	80.00
Machine shop turnings	30.00	to	31.00
Mixed borings and turnings	25.00	to	26.00
Shoveling turnings	32.00	to	33.00
Cast iron borings	44.00	to	45.00
Low phos. forge crop	99.00	to	100.00
Low phos. punchings plate 1/4 in. and heavier	114.00	to	115.00
Low phos. 2 ft. and under	108.00	to	109.00
No. 1 RR hvy. melting	76.00	to	77.00
Scrap rails random lgth	79.00	to	80.00
Reroller rails	104.00	to	105.00
Rails, 2 ft. and under	101.00	to	102.00
RR couplers and knuckles	92.00	to	93.00
RR car axles	106.00	to	107.00
No. 1 machinery cast	107.00	to	108.00
Cupola cast	94.00	to	95.00
Stove plate	99.00	to	100.00
Steel car wheels	89.00	to	90.00
Stainless			
18-8 bundles and solids	495.00	to	505.00
18-8 turnings	405.00	to	415.00
430 bundles and solids	125.00	to	135.00
430 turnings	85.00	to	95.00

Philadelphia

No. 1 hvy. melting	$ 70.00	to	$ 73.00
No. 2 hvy. melting	62.00	to	65.00
No. 1 dealer bundles	81.00	to	84.00
No. 2 dealer bundles	50.00	to	53.00
No. 1 busheling	80.00	to	83.00
Shredder scrap	83.00	to	86.00
Machine shop turnings	24.00	to	27.00
Mixed borings and turnings	24.00	to	27.00
Shoveling turnings	37.00	to	40.00
Low phos. 5 ft. and under	75.00	to	78.00
Low phos. 2 ft. punchings	96.00	to	99.00
Electric furnace bundles	83.00	to	86.00
RR specialties	75.00	to	78.00
Rails, 2 ft. and under	97.00	to	100.00
Cupola cast	87.00	to	90.00
Heavy breakable cast	53.00	to	56.00
No. 1 machinery cast	92.00	to	95.00

Detroit

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 47.00	to	$ 48.00
No. 2 hvy. melting	46.00	to	47.00
No. 1 dealer bundles	57.00	to	58.00
No. 2 bundles	28.00	to	29.00
No. 1 busheling	56.00	to	57.00
Drop forge flashings	38.00	to	39.00
Machine shop turnings	27.00	to	28.00
Mixed borings and turnings	9.00	to	10.00
Shoveling turnings	27.00	to	28.00
Cast iron borings	18.00	to	19.00
Heavy breakable cast	31.00	to	32.00
Mixed cupola cast	46.00	to	47.00
Automobile cast	70.00	to	71.00
Stainless			
18-8 bundles and solids	480.00	to	490.00
18-8 turnings	345.00	to	355.00
430 bundles and solids	115.00	to	125.00

Youngstown

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 56.00	to	$ 57.00
No. 2 hvy. melting	54.00	to	55.00
No. 1 dealer bundles	70.00	to	71.00
No. 2 dealer bundles	33.00	to	34.00
Machine shop turnings	20.00	to	21.00
Shoveling turnings	20.00	to	21.00
Low phos. plate	70.00	to	71.00
Electric furnace bundles	59.00	to	60.00
Galvanized bundles	57.00	to	58.00

Cleveland

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 54.00	to	$ 55.00
No. 2 hvy. melting	52.00	to	53.00
No. 1 dealer bundles	73.00	to	74.00
No. 1 factory bundles	67.00	to	68.00
No. 2 bundles	31.00	to	32.00
No. 1 busheling	65.00	to	66.00
Machine shop turnings	20.00	to	21.00
Shoveling turnings	20.00	to	21.00
Cast iron borings	18.00	to	19.00
Cut structural & plates, 5 ft. and under	65.00	to	66.00
Cut structural & plates, 2 ft. and under	87.00	to	88.00
Low phos. punchings plate	87.00	to	88.00
Foundry steel, 2 ft. & under	53.00	to	54.00
No. 1 RR hvy. melting	59.00	to	60.00
Rails, 2 ft. and under	88.00	to	89.00
Rails, 18 in. and under	90.00	to	91.00
No. 1 machinery cast	78.00	to	79.00
Mixed cast	45.00	to	46.00
Stainless			
18-8 bundles	480.00	to	490.00
18-8 turnings	350.00	to	360.00
430 bundles	120.00	to	130.00

Buffalo

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 51.00	to	$ 52.00
No. 2 hvy. melting	41.00	to	42.00
No. 1 busheling	66.00	to	67.00
No. 1 dealer bundles	66.00	to	67.00
No. 2 bundles	29.00	to	30.00
Machine shop turnings	13.00	to	14.00
Mixed boring and turnings	13.00	to	14.00
Shoveling turnings	19.00	to	20.00
Cast iron borings	23.00	to	24.00
Low phos. plate	74.00	to	75.00
Structural and plate, 2 ft. and under	75.00	to	76.00
Rails, 2 ft. and under	75.00	to	76.00
Scrap rails, random lgth	61.00	to	62.00
No. 1 machinery cast	74.00	to	75.00
No. 1 cupola cast	69.00	to	70.00

St. Louis

No. 1 hvy. melting	$ 69.00	to	$ 70.00
No. 2 hvy. melting	54.00	to	55.00
No. 1 busheling	80.00	to	81.00
No. 1 dealer bundles	79.00	to	80.00
No. 2 bundles	48.00	to	49.00
Machine shop turnings	19.00	to	20.00
Shoveling turnings	23.00	to	24.00
Cast iron borings	29.00	to	30.00
No. 1 RR hvy. melting	74.00	to	75.00
Rails, random length	74.00	to	75.00
Rails, 18 in. and under	97.00	to	98.00
RR specialties	78.00	to	79.00
Cupola cast	71.00	to	72.00
Heavy breakable cast	45.00	to	46.00
Stove plate	91.00	to	92.00
Steel car wheels	80.00	to	81.00
Rerolling rails	99.00	to	100.00
Unstripped motor blocks	54.00	to	55.00

Birmingham

No. 1 hvy. melting	$ 70.00	to	$ 71.00
No. 2 hvy. melting	66.00	to	67.00
No. 1 dealer bundles	70.00	to	71.00
No. 2 bundles	46.00	to	47.00
No. 1 busheling	70.00	to	71.00
Shredder scrap	88.00	to	89.00
Machine shop turnings	23.00	to	24.00
Shoveling turnings	36.00	to	37.00
Cast iron borings	36.00	to	37.00
Electric furnace bundles	65.00	to	66.00
Elec. furnace, 3 ft. & under	66.00	to	67.00
Structural and plate, 2 ft.	87.00	to	88.00
Structural and plate, 4 ft.	81.00	to	82.00
No. 1 RR hvy. melting	81.00	to	82.00
Scrap rails, random lgth	70.00	to	71.00
Rails, 2 ft. and under	87.00	to	88.00
Angles and splice bars	81.00	to	82.00
No. 1 cupola cast	82.00	to	83.00
Unstripped motor blocks	72.00	to	73.00

Cincinnati

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 51.00	to	$ 52.00
No. 2 hvy. melting	50.00	to	51.00
No. 1 dealer bundles	66.00	to	67.00
No. 2 bundles	32.00	to	33.00
Machine shop turnings	9.00	to	10.00
Shoveling turnings	12.00	to	13.00
Cast iron borings	19.00	to	20.00
Low phos. 18 in. and under	77.00	to	78.00
Rails, random length	59.00	to	60.00
Rails, 2 ft. and under	77.00	to	78.00
No. 1 cupola cast	64.00	to	65.00
Heavy breakable cast	25.00	to	26.00
Drop broken cast	70.00	to	71.00

New York

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 44.00	to	$ 45.00
No. 2 hvy. melting	35.00	to	36.00
No. 2 dealer bundles	20.00	to	24.00
Mixed borings and turnings	10.00	to	11.00
Machine shop turnings	4.00	to	6.00
Shoveling turnings	10.00	to	12.00
Clean cast, chem. borings	35.00	to	36.00
No. 1 machinery cast	79.00	to	80.00
Mixed yard cast	50.00	to	51.00
Heavy breakable cast	10.00	to	12.00
Stainless			
18-8 prepared solids	450.00	to	470.00
18-8 turnings	345.00	to	370.00
430 prepared solids	90.00	to	100.00
410 solids	75.00	to	85.00

Boston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 51.00	to	$ 53.00
No. 2 hvy. melting	41.00	to	42.00
No. 1 dealer bundles	53.00	to	55.00
No. 2 bundles	34.00	to	36.00
No. 1 busheling	59.00	to	61.00
Shredder scrap	61.00	to	63.00
Machine shop turnings	12.00	to	14.00
Shoveling turnings	18.00	to	20.00
No. 1 machinery cast	75.00	to	80.00
Mixed cupola cast	46.00	to	48.00
Heavy breakable cast	8.00	to	10.00

San Francisco

No. 1 hvy. melting	$ 43.00	to	$ 45.00
No. 2 hvy. melting	37.00	to	39.00
No. 1 dealer bundles	34.00	to	36.00
No. 2 dealer bundles	22.00	to	24.00
Machine shop turnings	8.00	to	9.00
Cast iron borings	8.00	to	9.00
No. 1 cupola cast	80.00	to	82.00

Los Angeles

No. 1 hvy. melting	$ 37.00	to	$ 39.00
No. 2 hvy. melting	31.00	to	33.00
No. 1 dealer bundles	29.00	to	31.00
No. 2 dealer bundles	16.00	to	18.00
Machine shop turnings	9.00	to	10.00
Shoveling turnings	10.00	to	11.00
Cast iron borings	8.00	to	9.00
Elec. furnace, 1 ft. and under (foundry)	70.00	to	72.00
No. 1 cupola cast	72.00	to	74.00

Seattle

No. 1 hvy. melting	60.00	to	62.00
No. 2 hvy. melting	51.00	to	53.00
No. 2 bundles	35.00	to	37.00
No. 1 cupola cast	89.00	to	90.00
Mixed yard cast	80.00	to	82.00

Hamilton, Ont.

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 76.00
No. 2 hvy. melting, cut 2 ft. and under	67.00
No. 1 dealer bundles	82.00
No. 2 bundles	58.00
Mixed steel scrap	56.00
Bush. new fact. prep'd	77.00
Bush. new fact. unprp'd	60.00
Machine shop turnings	30.00
Short steel turnings	30.00
Mixed borings and turnings	19.00
Cast scrap	92.00

Houston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 63.00	to	$ 64.00
No. 2 hvy. melting	52.00	to	53.00
No. 2 bundles	36.00	to	37.00
Machine shop turnings	11.00	to	12.00
Crushed turnings	28.00	to	29.00
Shredder scrap	73.00	to	74.00
Cut structural plate, 2 ft. and under	96.00	to	97.00
Cut structural plate, 5 ft. and under	75.00	to	76.00
Unstripped motor blocks	57.00	to	58.00
Cupola cast	85.00	to	86.00

STILL, LITTLE GOOD NEWS FOR ORDERS

The flow of new orders to durable goods makers has been coming in fits and starts. That has been true for a long time now.

The latest month of completed orders data was March—and it was another bummer. Orders, at $105.6 billion, were down 2.1 pct from February, which, in turn, was down 0.6 pct from January. During the nine-month period ending at the close of March, orders were down six times and up only three times.

The March orders volume of $105.6 billion looks a bit pale against the $107.7 billion volume far back in August of last year.

The recent pattern of orders for durable goods has defied many economists who, earlier this year, forecast a strengthening of orders in the first quarter. Now, many economists are calling for a strong last half for orders. So are many executives in durables lines.

Order volume in March would have shown an even sharper decline than the 2.1 pct recorded except that ever-bouncing defense-goods orders bounced upward at a more than 40 pct increase during the month.

The big hope of economists for the second half lies in expected sharp orders gains in computers and related durable goods lines. This hope is based largely on an expected cyclical rebound in those products, a falling dollar, a rising yen, continuing low interest rates and surging economies in Europe that portend greater world buying of U.S. goods.

However, forecasts and actual trend lines have lately been on different tracks for a number of key economic measures. For example, despite all the 'good signs,' the U.S. trade deficit actually worsened through the first four months of the year.

Orders right now seem to be at a critical point on a trip to somewhere—but where? And when?

Billions of Dollars, Seasonally Adjusted Monthly Total, Unless Otherwise Noted Source: U.S. Dept of Commerce		Latest Month or Qtr.	Previous Month or Qtr.	Year Ago
CAPITAL EXPENDITURES (Annual Rates)				
U.S. Industry, Total	1st Qtr*	$402.1	$389.0	$371.2
Manufacturing, Total	1st Qtr*	154.7	155.7	145.2
Manufacturing, Durable Goods	1st Qtr*	72.0	73.6	69.2
Mining Industry	1st Qtr*	15.3	15.2	15.1
KEY INDICATORS, Durable Goods Manufacturing				
New Orders	March	105.6	107.8	99.5
Shipments	March	103.2	105.8	102.1
Inventories	March	188.2	187.6	192.4
Unfilled Orders	March	360.0	357.6	353.6
NEW ORDERS, METALWORKING				
Capital Goods Producers, Manufacturing Industries	March	27.4	28.9	27.2
Capital Goods Producers Defense Industries	March	10.4	7.2	6.2
Primary Metals, Total	March	9.7	10.6	10.0
Steel (SIC 331)	March	4.0	4.5	4.1
Iron & Steel Castings (SIC 332)	March	1.2	1.3	1.2
Nonferrous Metals	March	4.5	4.8	4.7
Fabricated Metals, Equip. Industries, Total	March	17.1	18.6	18.0
Engines & Turbines	March	1.1	1.4	1.1
Farm Machinery & Equipment (Shipments)	March	0.8	0.8	1.0
Construction, Mining & Mat. Hdlg. Equip.	March	3.3	3.1	3.1
General Industrial Machinery	March	1.4	1.4	1.5
Metalworking Machinery	March	0.9	0.8	1.1
Machine Tools, Total ($Mil., Unadjusted)**	March	214.8	210.4	279.2
Machine Tools, Metalcutting**	March	159.7	168.6	227.0
Machine Tools, Metalforming**	March	55.1	41.8	52.3
Electrical Mach. & Equip. Industries, Total	March	17.0	15.7	15.9
Elec. Transmission Equip. & Ind. Apparatus	March	2.2	1.9	2.1
Household Appliances	March	1.3	1.3	1.3
Communication Equipment	March	6.2	5.7	6.3
Transportation Equipment, Total	March	24.5	28.5	22.5
Motor Vehicles & Parts (Shipments)	March	16.1	18.5	16.2
Aircraft, Missiles & Parts	March	7.5	7.9	5.0
Shipbuilding & Military Tanks	March	0.7	0.1	0.6
Fabricated Metal Products, Total	March	13.9	14.3	13.5
Instruments, Total	March	4.6	4.7	4.6